

AMENDMENTS TO THE CLAIMS

Claim 1 (previously presented). An elongate device for insertion into a living body, the device having an antenna at its tip for coupling radiation into biological matter and a dielectric body surrounding the antenna so as to encompass substantially the whole of the near-field of the radiation emitted by the antenna.

Claim 2 (previously presented). A device as claimed in claim 1 in which the dielectric body extends from the antenna a distance determined in accordance with the wavelength of said radiation in the dielectric.

Claim 3 (previously presented). A device as claimed in claim 1 in which the dielectric body extends from the antenna a distance determined in accordance with the major dimension (L) of the antenna in the dielectric.

Claim 4 (previously presented). A device as claimed in claim 1 in which the dielectric body extends from the antenna a distance at least substantially equal to $2L^2/\lambda$, where L is the major dimension of the antenna and λ is the wavelength of the radiation in the dielectric.

Claim 5 (currently amended). A device as claimed in claim 1 in which the dielectric body comprises a substantially cylindrical portion with the antenna extending axially at its ~~centre~~ center a distance L.

Claim 6 (previously presented). A device as claimed in claim 2 in which the dielectric body extends from the antenna a distance substantially equal to half the wavelength of said radiation in the dielectric.

Claim 7 (previously presented). A device as claimed in claim 1 in which the dielectric body is such that it has a dielectric constant at its core which is higher than the dielectric constant at its outer periphery, the latter being more closely matched to that of said living tissue.

Claim 8 (previously presented). A device as claimed in claim 7 in which the dielectric body comprises an inner core and an outer layer, each of a different dielectric constant.

Claim 9 (previously presented). A device as claimed in claim 8 in which the inner core and outer layer have those dimensions that extend from the antenna determined in accordance with the dielectric constant of each so that the overall dimension is a predetermined fraction of the nominal wavelength of the radiation in the dielectric.

Claim 10 (previously presented). A device as claimed in claim 9 in which the inner core and outer layer each have a dimension substantially equal to a quarter of the wavelength of radiation therein.

Claim 11 (previously presented). A device as claimed in claim 8 in which the outer layer is formed with indentations in its outer surface which serve to reduce the dielectric constant in this region when the indentations are filled with other matter.

Claim 12 (previously presented). A device as claimed in claim 7 in which the dielectric constant of the dielectric body varies continuously over at least a part of the distance from the antenna.

Claim 13 (previously presented). A device as claimed in claim 1 which has a tip portion that extends beyond the end of the antenna.

Claim 14 (previously presented). A device as claimed in claim 13 in which the tip portion is pointed to assist penetration of biological matter.

Claim 15 (previously presented). A device as claimed in claim 14 in which the tip portion is composed of a different material to the dielectric body.

Claim 16 (previously presented). A device as claimed in claim 13 in which the tip portion is an extension of the dielectric body and is rounded so as to support forward transmission of radiation.

Claim 17 (previously presented). A device as claimed in claim 16 in which the tip portion is substantially hemispherical.

Claim 18 (previously presented). A device as claimed in claim 17 in which the tip portion has a radius substantially equal to half the wavelength of the radiation in the dielectric.

Claim 19 (previously presented). A device as claimed in claim 1 in which the elongate device comprises a coaxial conductor with a central conductor that projects beyond outer screening of the coaxial conductor at the distal end to form the antenna.

Claim 20 (previously presented). A device as claimed in claim 19 in which the antenna has a length substantially equal to half the wavelength of the radiation in the dielectric.

Claim 21 (previously presented). A device as claimed in claim 19 including a transformer between the coaxial conductor and the dielectric body to reduce reflection of radiation back into the coaxial conductor at the boundary with the dielectric body.

Claim 22 (previously presented). A device as claimed in claim 21 in which the transformer includes a space within the coaxial conductor into which packing of the coaxial conductor can expand.

Claim 23 (currently amended). An elongate device for insertion into a living body, the device having an antenna at its tip for coupling radiation into biological matter and a dielectric body surrounding the antenna ~~so as to enhance transmission or radiation in the forward direction~~ and extending axially of, and beyond the end of, the antenna, and terminating in a rounded end portion that has a progressively reducing cross section along the axis away from the antenna, whereby transmission of radiation from the rounded end is enhanced.

Claim 24 (canceled).

Claim 25 (previously presented). A device as claimed in claim 24 in which the tip portion is substantially hemispherical.

Claim 26 (previously presented). A device as claimed in claim 25 in which the tip portion has a radius substantially equal to half the wavelength of the radiation in the dielectric.

Claim 27 (currently amended). A device as claimed in claim 23 in which the antenna extends into the dielectric body a distance substantially equal to half the wavelength of said radiation in the dielectric.

Claim 28 (currently amended). A device as claimed in claim 23 in which the dielectric body comprises a substantially cylindrical portion with the antenna means extending axially at its ~~centre~~ center.

Claim 29 (previously presented). A device as claimed in claim 23 in which the dielectric body extends from the antenna a distance substantially equal to half a wavelength of the radiation in the dielectric body.

Claim 30 (previously presented). A method of coupling radiation into biological material, the radiation being generated by an applicator comprising an antenna surrounded by a dielectric body, comprising the steps of selecting the dielectric constant of the body in accordance with the wavelength of the radiation in the dielectric so that substantially the whole of the near-field of the radiation is encompassed by the dielectric body.

Claim 31 (previously presented). A method as claimed in claim 30 in which the dielectric constant of the body is further selected in accordance with the major dimension of the antenna.

Claim 32 (previously presented). A method as claimed in claim 30 in which the dielectric body extends from the antenna a distance at least substantially equal to $2L^2/\lambda$, where L is the major dimension of the antenna and λ is the wavelength of the radiation in the dielectric.

Claim 33 (previously presented). A method as claimed in claim 30 in which the major dimension of the antenna is its length, which is substantially equal to half a wavelength of the radiation in the dielectric.

Claim 34 (previously presented). A method as claimed in claim 30 in which the dielectric body is located in relation to the biological material so that the far-field radiation lies within the biological material.

Claim 35 (previously presented). A method as claimed in claim 30 in which the dielectric constant of the body is high, but is lower than that of the biological material.

Claim 36 (previously presented). A method as claimed in claim 30 in which the dielectric constant of the dielectric body varies, and is higher at its core than its outer periphery, and the dielectric constant at its outer periphery is lower than that of the surrounding biological matter.

Claim 37 (previously presented). A method as claimed in claim 35 in which the dielectric constant at the core is greater than the dielectric constant of the biological matter.

Claim 38 (currently amended). A method of coupling radiation into biological material, the radiation being generated by an elongate applicator comprising an antenna surrounded by a dielectric body, the dielectric body being configured so as to ~~enhance transmission of the radiation in the forward direction along the elongate axis of the applicator~~ extend axially of, and beyond the end of, the antenna and terminate in a rounded end portion that has a progressively reducing cross section along the axis away from the antenna, whereby transmission of radiation from the rounded end is enhanced.

Claim 39 (previously presented). A method as claimed in claim 38 in which radiation is partially reflected internally of the dielectric body so as to be transmitted in the forward direction.

Claim 40 (previously presented). A method as claimed in claim 39 in which the dielectric constant of the body is high but is lower than that of the biological material.

Claim 41 (previously presented). A method as claimed in claim 38 in which the dielectric body has a substantially hemispherical tip portion with a radius substantially equal to half the wavelength of the radiation in the dielectric.

Claim 42 (previously presented). A method as claimed in claim 38 in which the antenna has a length substantially equal to half the wavelength of the radiation in the dielectric.

Claim 43 (previously presented). A method as claimed in claim 38 in which the dielectric body extends from the antenna a distance substantially equal to half the wavelength of the radiation in the dielectric.

Claim 44 (previously presented). A method of treating a tumor in a liver using a radiation applicator comprising an elongate body with a pointed tip for insertion into the liver and a power input to generate microwaves within the body and to transmit microwave radiation into the liver, the method comprising the steps of inserting the pointed tip into the liver at a point in the region of the tumor and powering the applicator via the power input to transmit microwaves and heat said region of the tumor.

Claim 45 (new). An elongate radiation applicator for insertion into a living body to couple radiation into biological material, the applicator comprising an antenna and a dielectric body surrounding the antenna, the length of the antenna and the dielectric constant and dimensions of the dielectric body relative to the antenna being selected in relation to an intended operating frequency of the applicator so that the dielectric body encompasses substantially the whole of the near-field of radiation emitted by the antenna.